NATURAL AND CULTURAL RESOURCES

NATURAL RESOURCES

AIR RESOURCES

CONTEXT: Air quality at Cape Cod National Seashore is affected under certain conditions by pollutants from urban/industrial areas to the southwest and from Boston to the northwest. The national seashore is part of the Metropolitan Providence Interstate Air Quality Region to the southwest; this region does not meet EPA standards for ozone; because of prevailing winds, ozone concentrations at the seashore have been among the highest reported in any unit of the national park system. The Boston Metropolitan Air Quality Region, 100 kilometers northwest, does not meet EPA standards for ozone or carbon monoxide.

The major pollutants originating in the seashore are vehicle emissions, primarily during the peak summer months. The *Long Range Transportation Plan* developed by the Cape Cod Commission identifies the need to substantially reduce vehicle emissions.

Of the three air quality categories established for national park system areas, Cape Cod National Seashore is a class II area, which means the state may permit some new air pollution as long as neither national ambient air quality standards nor maximum allowable increases over baseline conditions are exceeded. Evidence suggests that reduced growth and increased mortality of some sensitive plant species are occurring in heavily polluted areas of the national park system, perhaps decreasing species diversity. While current information does not exist to confirm such damage at Cape Cod National Seashore, there is reason to monitor possible air quality concerns to protect the seashore's resources and values.

Precipitation chemistry has been monitored since 1981. Many of the kettle ponds and vernal pools are poorly buffered, increasing their sensitivity to acid precipitation and atmospheric deposition of heavy metals and nutrients.

No monitoring of visibility has taken place. Air quality related impacts on vegetation or other resources in the seashore need to be more fully assessed.

□ **GOAL: Engage in cooperative regional efforts to improve air quality.**

STRATEGIES: *Research and monitoring programs* — The National Park Service will continue cooperative efforts with the Massachusetts Department of Environmental Protection, the Environmental Protection Agency, and other agencies to expand research and monitoring programs, including the effect of air pollution on relevant natural and cultural resources. The Park Service will also work to help develop emission control strategies for reducing existing air quality problems at Cape Cod and preventing future occurrences.

Biological effects of air pollution — A program for monitoring the biological effects of air pollution will be developed. Seashore staff, in conjunction with

NPS and other experts, will determine which plant and animal species may be used as indicator species.

Air quality impacts from within the national seashore — Means to reduce impacts may include using cleaner means of transportation (such as propane or electric powered vehicles) and converting existing facilities to alternative energy sources. Temporary air quality impacts of prescribed burning will be considered in accordance with the approved *Fire Management Plan* (see discussion under "Vegetation," page 39).

Regional air quality partnerships and class I status — To reduce threats to seashore resources and human health, the National Park Service will participate in regional air quality partnerships in Massachusetts and other states. Such participation may include requests for involvement in emission permit reviews, rule making, and planning related to air quality to reduce threats.

To ensure the highest possible protection for natural and cultural resources, the Park Service will cooperate with the Environmental Protection Agency, residents, and businesses, to request the state to consider redesignating Cape Cod National Seashore as a class I area instead of a class II area. This will strengthen the ability of the Park Service to influence air quality emissions on a regional level. Under class I status continuous efforts must be made to maintain a specific standard of air quality at the national seashore, in accordance with the Clean Air Act.

The CLEAR initiative — Cape Cod National Seashore will participate in a program known as A Clearer Look at Eastern Air Resources (CLEAR). This program emphasizes cooperative efforts by local, state, and federal agencies to minimize air pollution impacts on natural and cultural resources, to protect public health, and to enhance public enjoyment.

Public reporting — When air pollution episodes exceed state or federal health standards, visitors will be advised of potential health risks.

COASTAL PROCESSES

CONTEXT: Cape Cod is composed almost entirely of material deposited by glaciers that retreated about 14,000–18,000 years ago. Wind and water reworked these sediments to create beaches, spits, marshes, pamets, cliffs, and dunes. Coastal processes such as tides, winds, storms, and longshore sediment transport continue to shape and reshape the area. Cape Cod's outer beach is renowned for its long, largely undeveloped expanses of sand.

In addition to their value as habitat, the natural landforms of the Cape protect landward areas from the force of storms and coastal flooding. Beaches and marshes dissipate storm waves over their gradual slopes. Dune systems prevent direct wave action against inland areas.

Natural coastal processes, however, are also responsible for damage to structures. NPS facilities have been lost, and time and money have been spent to protect, reconstruct, and relocate facilities. General NPS policy is to let shoreline processes take place unimpeded.

Extensive information on coastal processes within Cape Cod National Seashore is available; however, further research would be helpful in making decisions. Examples of shoreline processes include erosion, accretion, and changes to dunes, inlets, and bluffs.

GOAL: Allow natural shoreline processes to take place unimpeded, while also counteracting human-caused disturbances.

STRATEGIES: *Inlet formation, overwash, dune migration and formation* — The following criteria will determine the response to inlet formation, overwash, and dune migration and formation:

- Allow all overwashes and blowouts to occur without human disturbances, except for minor intervention, such as sand fencing and dune grass planting where there is evidence of human-induced impacts, with consideration of public safety.
- Prevent artificial beach nourishment on NPS land, and discourage beach nourishment on town and private land within the national seashore.
- Prevent revetment of marine scarps on NPS land, and discourage such activities on town and private land within the national seashore.
- Monitor inlet formations, overwash, and dune migration and formation, and initiate follow-up actions on a case-by-case basis.

Where town and private lands are involved, the national seashore will assist in scientific analysis to plan ahead for natural shoreline changes that may affect public and private facilities or interests. Analysis may include participation in evaluating the problems, conducting research and predictive modeling, devel-

oping a full range of options, and generating possible mitigating actions. Where beach nourishment or revetment construction occurs on town or private land, the National Park Service will work actively to minimize adverse effects on federal property and national seashore resources by attempting to influence the design and management of the project and its mitigations.

Beach nourishment activities — Staff at the national seashore, in consultation with staff of the Massachusetts Office of Coastal Zone Management, will develop a policy statement clarifying the NPS position on discouraging beach nourishment activities within the national seashore. This statement will be developed as part of a cooperative program with other national park system areas along the Atlantic seaboard. The rationale for discouraging such actions, in accordance with NPS and seashore policies, will be explained. Additionally, the National Park Service will continue to discourage the deposition of dredge spoils on town and private lands within the national seashore, and it will not allow such deposition on NPS lands due to the level of interference with natural coastal processes.

Sand fencing and dune grass planting — In allowing natural shoreline processes to occur, the use of sand fencing and dune grass planting to protect NPS property will be minimized as much as possible. Such minor intervention will be used to counteract human disturbance. The National Park Service will also encourage judicious use of these mitigation methods on municipal and private lands.

Coastal facility maintenance in stable areas — Where coastal systems are in equilibrium, some minor actions may be taken to cost-effectively manage nuisance sand. Examples include moving sand that has shifted from one side of a parking lot to another, or moving sand from one parking lot to another in the same geologic sand transport system or zone. No habitat alteration will be permitted, and there will be no attempt to interfere in a progressive coastal erosion situation.

The maintenance of developed facilities and hardened surfaces in stable coastal areas, such as Herring Cove Beach, will continue unless catastrophic damage occurs that requires capital replacement (also see the Herring Cove beach discussion in "Public Use: Activities, Facilities, and Services," page **Error! Bookmark not defined.**). At that time alternative design, siting, and management approaches will be developed in consultation with affected towns.

Facilities/cultural resources threatened by coastal erosion in progressive erosion areas — Whether to move or rehabilitate facilities and cultural resources that are seriously threatened or damaged by coastal erosion or storm events will be decided on a case-by-case basis, using consistent criteria and in consultation with affected towns. No relocations will be allowed that will affect or will be sited in sensitive resource areas. Facilities in the coastal flood hazard area, which is directly subject to severe wind and wave action, will be relocated or moved back from the coastal bank or hazard area. When deciding whether to relocate, rehabilitate, redesign, or remove facilities, buildings, bathhouses, access points, and other developments within coastal areas and on seashore beaches, the following questions will be considered:

- Is the facility serving a core public use or park management function? Can this function be provided at an alternative location?
- Is the facility currently preventing natural coastal process from taking place, such as coastal erosion, dune migration, sediment supply to adjacent beaches, flooding or flood protection, or vegetation succession?

- Does the facility require extensive, or beyond normal, maintenance to keep it and the surrounding environs safe and open to the public?
- Is the facility on top of, in, or encompassing sensitive resources, such as a barrier dune, wetland, coastal bank, pond, or ocean beach, or is it causing impacts to adjacent residences?
- Does the facility currently conform to relevant federal and state environmental regulatory laws?
- Is there an alternative location for the facility that would not impair public use of the beach or resource area but would reduce its environmental impact?
- Is the facility in a sustainable location in terms of (1) water use and wastewater disposal, aesthetics, and public safety; (2) its compatibility with the functioning of natural systems?

Exceptions may be considered to protect resources, such as providing boardwalks and stairs to prevent dune damage or shuttle dropoffs to reduce parking. Additionally, historic resources will be subject to other criteria (see page **Error! Bookmark not defined.**).

Alternatives to groins, jetties, revetments, or seawalls — The National Park Service will explore alternatives to prevent the construction of groins, jetties, revetments, or seawalls on all lands within the national seashore, including town and private property. Cooperative efforts will be undertaken with the Cape Cod Commission, the Office of Coastal Zone Management, the Massachusetts Natural Heritage and Endangered Species Program, and the USDA Natural Resources Conservation Service. Possible actions include designating sensitive coastal areas as districts of critical planning concern or developing a task force on coastal processes to examine this issue. Soft solutions to deal with coastal erosion, such as dune grass planting, will be emphasized on non-NPS lands.

Long-term monitoring □ The purpose of a comprehensive, long-term monitoring program for shoreline processes will be to help seashore managers distinguish between natural and human-induced changes by providing a measure for change, and to make appropriate resource management decisions. A cooperative program involving private landowners and public agencies will be essential because coastal processes transcend private and political boundaries.

WATER RESOURCES

CONTEXT: Marine resources open ocean, estuaries, and adjacent intertidal areas are all influenced by the tidal cycle, ocean currents, and the influx of fresh surface and groundwater. Estuaries serve as nurseries for fish and shellfish, making them extremely valuable, and intertidal communities are some of the most biologically productive ecosystems in the world.

Freshwater resources groundwater, streams, vernal pools, and kettle ponds in turn support wetlands, fisheries, riparian areas, and other water-dependent features.

Development, recreation, and public use within Cape Cod National Seashore affect both water quality and quantity. There are growing signs that coastal water quality is deteriorating, as evidenced by debris washing up on beaches and by shellfish beds being closed to harvest because of high concentrations of coliform bacteria in surface waters.

Significant growth in the number of summer and permanent residents has increased groundwater use during the past 30 years. Groundwater extraction for municipal and other water supply purposes may adversely affect water-dependent resources, including wetlands. Groundwater quality is primarily threatened by contamination from nutrients from sewage disposal and saltwater intrusion.

The National Park Service recently acquired water wells within the former North Truro air force station and is continuing the Air Force-initiated seasonal, emergency provision of water to the town of Provincetown on a temporary basis. The resolution of this unusual situation presents a practical application of the seashore's water resource planning function.

Before the national seashore was authorized, at least a portion of all coastal wetlands and floodplains (both freshwater and marine) had been altered by diking, ditch drainage, road and railroad construction, or mosquito control measures. These actions led to a loss of wetlands, and the restriction of seawater flow (by means of tidal influx) triggered chemical changes that degraded once productive wetland fish and wildlife habitat. Most physical alterations persist, despite efforts to restore diked systems. Multiple ownership, diverse management objectives, and overlapping jurisdictional status complicate and prolong the restoration process.

 GOAL: Protect ground and surface water quality and quantity, as well as adjacent wetlands.

STRATEGIES: *Implementation of the national seashore's water resource management plan* — Groundwater quantity and quality is likely to become the

most important social and political issue on the Cape in the near future, as there are limited areas for developing supply wells outside national seashore boundaries. Complicating the issue is the fact that the presence of water, the ability to withdraw it, and the effects of withdrawal are not and cannot be managed strictly within administrative boundaries of landownership. Within this context the water resource management plan for the national seashore addresses the long-term management of both estuarine and freshwater resources and provides guidance on water resource issues.

Participation with regional and town water resource planning groups — An Outer Cape community-wide discussion needs to continue about how to manage groundwater resources to preserve the natural, cultural, and economic characteristics that make the Cape so special. To that end the National Park Service jointly participated in and contributed to the recent development of a coordinated regional groundwater management study for local towns. The Cape Cod Commission's 1997 *Final Report of the Lower Cape Water Management Task Force* addresses groundwater issues of regional concern and identifies and evaluates potential municipal well sites in Eastham, Wellfleet, Truro, and Provincetown. The Park Service will continue to recommend that this planning report be used as a basis for further research and development of a regional approach to groundwater management.

A professional water resource management program — The National Park Service will require expertise in both hydrology and hydrogeology for the collection and analysis of data for seashore managers and to more effectively manage water resources. This program will develop resource condition criteria affected by potential water use in and around the national seashore. The program's goals will include: (1) establishing carrying capacities of the aquifer lenses; (2) working with the local communities regarding water supply and demands, and (3) carrying out the specific strategies outlined below.

A water resource database — In collaboration with local communities and other public agencies, a comprehensive water resource database will be developed from information collected by the NPS staff in cooperation with private landowners and others. The affected local communities and the state will be invited to help develop the components of this study, the manner of data collection, and the management of the database. Operational agreements and mechanisms to transfer funds and staff between agencies and research institutions will also be developed. An automated retrieval system for resource information from other water resource institutions using technologies such as Internet will be developed, and all accumulated information will be made available to the affected communities on a periodic basis. Expertise in database management will be required to support the inventory and monitoring program.

Water quality criteria and limits of acceptable change — Together with the Cape Cod Commission (or a similar regional agency) and the U.S. Environmental Protection Agency, the U.S. Geological Survey, the Massachusetts Department of Environmental Protection, and the towns, the National Park Service will cooperate in identifying and defining resource-specific water quality standards and limits of acceptable change. Based on appropriate scientific data, monitoring will ensure that these natural resource standards and thresholds are not compromised.

Existing authority for water use — Currently, the National Park Service has very limited authority to provide water, or any other resource, to non-NPS entities. In conformance with NPS Special Directive 78-2, the Park Service

may consider a temporary, short-term sale or lease of water from inside a unit of the national park system to a non-NPS entity, but only if the following conditions are met:

- The entity provides services of direct or indirect benefit to the park unit or park visitors.
- There is no reasonable alternative water supply available.
- The effects on the park's environment, administration, management and protection, and visitors have been examined, and these effects have been determined to be acceptable.
- The water use is in accordance with laws and regulations governing ownership and use of federal water and rights.
- The government would recover the full cost of providing the water.
- The arrangement has been reviewed in Washington.
- The use is for a short time (one year or less), is revocable, does not convey permanent rights, and is conditioned to allow NPS review of planned development by the applicant that would increase water demand.

The National Park Service will consult with other federal and state agencies and local communities to determine the options and alternative water supplies in deliberating on any proposal for a temporary, short-term sale or lease of water.

New approaches to the withdrawal of water from inside the seashore □ The merits of the National Park Service providing groundwater to towns through an exchange of rights and working with towns to develop water conservation measures and growth controls will be studied. Hydrological circumstances may exist that favor the use by municipalities of water withdrawn from within the national seashore. Specifically, if municipalities near the seashore developed their groundwater resources on lands immediately outside the seashore, then it is possible that seashore water-dependent resources could be injured. The Park Service is gathering scientific information about the effects of groundwater pumping to determine if town water supply wells on municipal lands adjacent to NPS property (both inside and outside the boundaries) are adversely affecting seashore resources or may do so in the future.

In accordance with the National Environmental Policy Act, an environmental review would be necessary to identify municipal well sites that were most protective of national seashore resources and values. This document would also analyze environmental consequences, including impacts to vegetation, wildlife, and other freshwater-based resources, as well as surrounding well water quality. The Park Service would determine whether there was a benefit to seashore resources from allowing water withdrawal within the boundary (thus avoiding or significantly reducing the impacts of groundwater withdrawal outside but near seashore lands, which could ultimately have greater adverse effects on national seashore resources than withdrawal from within seashore boundaries). As stated above, the National Park Service currently has limited administrative authority. If allowing a water withdrawal within the boundary appeared beneficial, then a long-term legislative or administrative solution would be sought. A solution would have to include an extensive monitoring program to identify any unforeseen adverse impacts so that withdrawal provisions could be adjusted and other mitigations required if necessary.

Private septic systems — Research will be conducted to identify the impacts of private septic treatment systems on seashore wetlands, ponds, and estuaries, and alternatives to mitigate impacts will be developed. Alternatives may include encouraging private landowners to use alternative wastewater treatment procedures.

Nitrate contamination — To limit nitrate contamination of bays and estuaries, as well as of freshwater wetlands and ponds, all NPS septic treatment facilities will be upgraded to remove nitrates from the waste stream. Public septic facilities adjacent to sensitive resources, such as the Salt Pond visitor center, will be upgraded first, followed by facilities for NPS housing within the seashore (also see septic system discussion in the "Utilities" section, beginning on page **Error! Bookmark not defined.**). The contribution of town and private septic systems will also be evaluated, as necessary.

Alternative potable water sources and wastewater treatment techniques — For NPS facilities other potable water sources and wastewater treatment techniques (including graywater management) will be developed, with a public demonstration project at the Salt Pond visitor center to showcase sustainable practices to the public (also see the "Utilities" section, page **Error! Bookmark not defined.**).

Wastewater treatment facility outfall pipe — National seashore managers will work with other interested parties on Cape Cod to provide feedback to the Massachusetts Water Resources Authority concerning the discharge permit and other permits for the wastewater treatment facility outfall pipe. The treatment facility is planned in part to address the cleanup of Boston Harbor; however, the outfall pipe has the potential to adversely affect Cape Cod Bay. The National Park Service will work with the Cape Cod Commission, the towns, and others to raise concerns regarding the assessment and mitigation of project impacts, including establishing an environmental baseline to determine if and when there are changes; monitoring nutrients, water temperature, toxics, and toxins or viruses; and preparing a contingency plan in the event of adverse impacts, with a commitment to timely mitigations.

Improper drainage remediation — Road and parking lot runoff that creates point-source water pollution will be corrected. The National Park Service will work with the Massachusetts Highway Department, towns, and private individuals, as necessary. Various drainage solutions will be applied to improve water quality at ponds and wetlands, and as water flows into the bay and the ocean.

Wetlands protection — The national seashore will continue to consult with town conservation commissions and the Massachusetts Department of Environmental Protection (in accordance with the Massachusetts Wetlands Protection Act) to review federal projects affecting wetlands, dunes, and the coastal bank. This consultation is required by the Clean Water Act. The national seashore will also respond to requests to review projects proposed by adjacent landowners and requiring variances from the state's Wetlands Protection Act.

Kettle ponds — The present kettle pond monitoring program will be reviewed and improved, and specific resource management plans will be developed for all ponds in the national seashore, in cooperation with towns and landowners, the county, and the state. Ponds with similar features, or those near each other, will be managed in a consistent fashion. Clusters that may be managed include those around Duck Pond, Gull Pond, Slough Pond, Snow Pond, and Spectacle Pond. Management plans will include strategies to reduce recreational use

impacts (for example, using no-flush toilet systems, or hardening access to shorelines).

Aquaculture — The effects of aquaculture on marine resources (including water quality) will be researched, and monitoring procedures will be developed. (Also see the description of aquaculture under "Vegetation and Wildlife," beginning on page 40).

Offshore activities and incidents — In accordance with applicable regulations, the National Park Service will work cooperatively with state agencies and towns to monitor, respond to, and regulate offshore activities and incidents that occur within the national seashore boundary (which migrates with shoreline change at a quarter mile offshore) and that may affect seashore resources.

□ **GOAL: Restore the natural hydrography and ecology of estuaries in consultation with affected municipalities.**

STRATEGIES: *Salt marsh restoration at Hatches Harbor* — The salt marsh at Hatches Harbor will be restored incrementally to ensure that restoration will not cause unforeseen adverse effects. The restoration work is subject to a memorandum of understanding with the town of Provincetown that details the development of a long-term cooperative arrangement for incremental restoration and ensuring no adverse impacts on the airport. Monitoring before and after each restoration step will document changes. Any alterations in the restoration process needed to deal with unforeseen effects will be determined by a review committee composed of representatives from the airport commission, the Federal Aviation Administration, the national seashore, and other interested parties.

This project will require continued coordination with various private and public entities, along with extensive outreach, and continued ecological monitoring. The reversion from a freshwater marsh back to a salt marsh system will be designed so as to still provide storm and tidal flooding protection for Provincetown Municipal Airport. Restoration work at Hatches Harbor has been proposed since 1986; a separate environmental assessment for this project is now being prepared.

Salt marsh restoration at Herring River — Restoration will increase fish nursery and breeding habitat, improve water quality, and decrease herring kills and other aquatic problems. It will also address the reestablishment of herring runs, as well as protection issues for existing land uses partially located in the floodplain. The restoration project will be based on past extensive studies of the hydrology, biology, and chemistry of this system, and it will be coordinated with the town of Wellfleet, state and federal agencies, fishermen, adjacent private landowners, and the community golf course. An environmental assessment will be prepared, required regulatory clearances will be obtained, and any necessary mitigation measures and monitoring will be identified.

Pamet River restoration — The Pamet River restoration project will respond to (1) existing problems in the Pamet River system shared among the town, the national seashore, and numerous private property owners, and (2) a desire to improve the ecological balance in areas affected by the artificially diked system. The natural drainage and waterflow of the Pamet River will be studied to understand its current condition and to determine the interactions of freshwater, groundwater, and saltwater in the river system. Concerns regarding saltwater reintroduction will be addressed, including impacts to private wells, and an analysis of biological and physical changes from extending tidal flow

into freshwater areas. Complete saltwater restoration is not proposed throughout the entire Pamet River valley because it is precluded by the extent of existing roadways and development.

Pilgrim Lake — Pilgrim Lake is a coastal lagoon that functioned until 1868 as a tidal estuary and salt marsh system that was connected to Cape Cod Bay by an inlet; original tidal flow has been eliminated. The ecology of Pilgrim Lake will be studied to determine how to restore the lake to a more balanced hydrological state. Concerns to be addressed include continuing experiences with algal blooms, fish kills, and insect outbreaks, and the feasibility of returning Pilgrim Lake to a more natural tidal system.

CONTEXT: The plant and animal communities on Cape Cod have adapted to the unique aspects of this coastal barrier environment. Because these communities are part of the ecosystem, management involves working cooperatively with regional, local, and individual stakeholders to understand and protect the entire system on a sustainable basis.

At least 800 plant species occur within the seashore in a wide variety of community types, including heathlands, freshwater and saltwater wetlands, upland forests, beaches, dunes, and grasslands. No federal threatened or endangered plant species are known within the national seashore; however, the seashore has 20 plant species that are classified as threatened, endangered, or of special concern by the state. Nonnative plant species compete with and could displace native species. The use of pesticides and other chemicals within and near the seashore may affect native plants.

During the last 50 years natural succession has changed vegetative patterns within the seashore, with open fields and heathlands succeeding to a mostly closed-canopy pitch pine and oak forest, with an understory of highly flammable live and dead fuels. Heathland communities, which support a wide diversity of plants and animals, are becoming increasingly diminished as a result of this encroachment.

Over 500 animal species inhabit the seashore, including migratory and resident birds, terrestrial and marine mammals, reptiles and amphibians, and salt- and freshwater fish, as well as invertebrate species. Inventories for most major taxonomic groups are lacking. The seashore has 17 federal threatened or endangered animal species. To protect the threatened piping plover, an intensive management program has been developed; however, no management programs have been implemented for the other species. The seashore also has 42 species that are listed as threatened, endangered, or of special concern by the state. While the seashore has a comprehensive tern management program, no other programs have been developed to protect state-listed species.

The National Park Service allows hunting and fishing within the national seashore under the discretionary authority of the authorizing legislation; both the state and the Park Service share jurisdiction over hunting and fishing. Shellfishing is under the jurisdiction of the state and the towns. Trapping is prohibited.

VEGETATION AND WILDLIFE

- **GOAL: Manage native biotic resources by allowing natural processes to continue unimpeded except where appropriate to selectively manage for native biological diversity or rare, threatened, or endangered species or communities.**

STRATEGIES: *Vegetation and wildlife database* — A comprehensive database for plants and animals will be developed. Inventories of fish, invertebrates, and small mammals will be conducted to augment existing inventories for other groups. National seashore staff will consult with local experts and others. Based on this information, a long-term monitoring program will be established to help seashore managers understand the differences between natural and human-

induced changes and to make appropriate resource management decisions. Collaboration with affected communities will occur as needed.

Species listed by the state or federal government as endangered, threatened, or of special concern — The National Park Service will ensure that national seashore management is consistent with the protection of rare, threatened, or endangered species listed by or proposed for listing by the state or federal government. In accordance with the Endangered Species Act and NPS policies, the National Park Service will work with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Massachusetts Natural Heritage Program, towns, and groups such as the Native Plant Conservation Program to protect and manage such species. Where information is available, work will be undertaken to restore native species lost because of human intervention. State authorities will be regularly contacted to update inventory lists and to consult on all activities that may affect state-listed species.

As needed, special management plans will be prepared for listed and proposed species. These plans will include assessments of existing and proposed management actions as they might affect a species. Species listed by the state or federal government will be protected at a similar level throughout the seashore, regardless of management zone. To protect or manage listed threatened or endangered species, human access will be maintained to the extent possible for an area and will be consistent with the management needs for that species.

Fire management — In accordance with the national seashore's approved *Fire Management Plan,* the natural role of fire will be researched and then restored or simulated in fire-dependent ecosystems and in selected areas using prescribed burning techniques. Prescribed burning may also be a useful management tool to maintain or restore cultural landscapes. Reintroducing the role of fire will only be done in areas where feasible, considering political, social, and environmental restrictions. Fuel levels around identified NPS structures will continue to be reduced. Prescribed burning will only be carried out under favorable atmospheric conditions. Fire and other sand roads will be maintained to varying levels to provide access for fire suppression.

Heathlands — The Park Service will develop management plans for heathlands, which are relatively rare in the United States and restricted throughout the world. Such communities will be preserved in various locations for their contribution to global biodiversity and to perpetuate the quality of open moors for cultural and aesthetic enjoyment. Because heaths are caused by natural disturbances such as severe storms or fire, or from intense human activity, the locations of heathlands may change over time as existing areas naturally succeed to other communities and new disturbances create heaths in other areas. Vegetation management techniques, including the use of controlled burning, may be employed to retain heath communities in selected areas.

Restoring native habitats and revegetating disturbed areas — National seashore managers will engage in revegetation and soil stabilization projects to prevent or correct resource degradation. Vegetation management will include the planting of native species for erosion control, wildlife habitat, and the mitigation of impacts from construction projects and public use. The USDA Natural Resources Conservation Service will continue to work with the national seashore to collect and propagate native plant species.

Nonnative species management — A comprehensive management program for nonnative species will be developed based on studies of the abundance, distribution, and potential impacts of nonnative species on native biota and

natural processes. Some nonnative species may be controlled or eliminated (for example, invasive nonnative species that threaten native species or habitat). Native species will be used in all NPS revegetation and development projects, and owners of improved properties and seashore neighbors will be encouraged to reduce the use of nonnative varieties that could have long-term adverse effects on seashore resources. One method to help control nonnative species will be to provide educational programs in the community and to distribute research results. In addition, the Park Service could recommend native species to be sold in local nurseries for use by residential property owners and seashore neighbors.

Required expertise — To accomplish vegetation and wildlife management programs, the national seashore will need expertise in aquatic ecology, terrestrial ecology, and wildlife biology.

□ **GOAL: Manage special uses affecting wildlife populations and other biotic resources to minimize ecosystem impacts and to sustain natural processes.**

Shellfish aquaculture activities within the national seashore — As an upland landowner, the National Park Service will cooperate with state agencies and local towns on shellfish aquaculture activities within the national seashore. Shellfish aquaculture uses of tidal flats within seashore boundaries will be supported if the customary low technology and dispersed character of small shellfishing grants for individuals and families are maintained, and if cultural patterns of use and enjoyment are sustained, as long as marine biodiversity is safeguarded.

The Park Service will research and monitor the potential effects of shellfish aquaculture activities on the health of native species, marine systems, and genetic diversity. As an upland landowner, the Park Service will also provide technical input to town shellfish officers regarding the municipal issuance or renewal of shellfish aquaculture grant permits within national seashore boundaries. Issues to be addressed will include maintaining the genetic integrity of wild shellfish beds and limiting pollutant discharges into bays and estuaries. Because the National Park Service has a responsibility as an upland owner, when national seashore managers are approached to evaluate aquaculture activities, they will consider the following:

- species proposed □ native species would be preferred over the introduction of exotic species or species not normally found in the habitat proposed for aquaculture use
- potential impacts of increased aquaculture development on marine systems and other environmental, recreational, and aesthetic impacts
- considerations of the density of aquaculture use in balance with other values of the tidal flats and coastal area

Finfish and aquatic plant aquaculture — Finfish and aquatic plant aquaculture, including such technologies as floating pens, will be reviewed and allowed within national seashore boundaries if the proposal (1) is compatible with current uses and values of the specified area, (2) will maintain marine water quality, (3) will not involve the introduction of any kind of exotic species or native species not normally found in the habitat of the project area, or (4) is for research or other noncommercial purposes (due to strict congressional control

over commercial activity in units of the national park system). In the case of any viable finfish aquaculture proposals, the project proponent will be required to fully analyze the environmental effects of the proposal in accordance with the National Environmental Policy Act before a decision is made by the National Park Service regarding its appropriateness. The Park Service will cooperate in defining what information may be needed to evaluate the proposal. The applicability of any appropriate deed restrictions or federal and state regulations will be considered.

Stocking and reintroduction programs — A consistent policy toward stocking programs for hunting and fishing will be developed in cooperation with the Massachusetts Division of Fish and Wildlife. The use of native species will be encouraged in such programs.

Hunting, fishing, and shellfishing — Hunting and fishing within the national seashore (focusing on native species) will be allowed at levels compatible with the purposes of the seashore and with sustainable populations and ecosystems. Efforts will be made to minimize conflicts with other visitor uses and private property. Public safety will continue to be addressed by use area designations, patrols, and other monitoring techniques. Habitat will not be altered merely to support game animals. Shellfishing activities will not be altered by the proposed plan; they will continue to be managed by the state and local communities.

Pest management — A comprehensive pest management program will be developed to control nuisance insects and other pests by using environmentally sensitive solutions that will protect important resources. Pest species, such as brown-tailed moths and mosquitoes, will be defined in accordance with NPS policies (also see the glossary). Pest-control methods are always to be the least toxic, use the minimal amount needed, and must be targeted at a specific pest without harming other plant or animal species. An educational program will be developed to explain to the public what a pest species is and why an integrated management approach is needed.

To ensure a healthy aquatic ecosystem, the Park Service will work with the state's Cape Cod Mosquito Control District and the Cape Cod Cooperative Extension (through the University of Massachusetts) in developing appropriate responses and techniques to respond to nuisance insects affecting visitors and neighbors of the national seashore. The need to cooperatively reduce adverse effects of nuisance insects and their management methods will be